SOURCE APPORTIONMENT OF WINTER CARBONACEOUS MATTER IN CENTRAL EUROPE – COMPARISON OF THREE METHODS

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Although particulate matter is widely recognized as a factor negatively influencing health and environment, many regions in Central Europe are still seriously affected by concentrations exceeding the regulatory limits. These exceedances occur mostly in the cold season and pose a problem at both, urban and background sites. In the following work we analyzed a data-set obtained during a winter campaign in the Austrian-Slovenian border region, where particulate matter related to wood combustion seems to play the leading role. The origin of carbonaceous PM_{10} is resolved by models based on macro tracers, radiocarbon (^{14}C) and Aethalometer measurements. Our aim is to compare these three approaches.

Particulate matter sampling and on-line black carbon measurements with an Aethalometer were performed simultaneously during 18 days, between 29 January and 28 February 2011 at three urban, and four background sites located in Klagenfurt (Lower Carinthia, Austria), Southern Styria (Austria) and Maribor (Northern Slovenia). PM_{10} was collected in 24 hour intervals using high-volume samplers. Quartz fiber filters with PM_{10} were analyzed for carbon parameters (OC/EC), anhydrosugars, humic-like substances, major ions and elements, as well as for ^{14}C, to distinguish between fossil and non-fossil carbon fractions.

The sample set represents typical winter conditions with different pollution episodes. The total carbon fraction was similar at all sites and amounted on average 28% of PM_{10}. Residential wood combustion was recognized as the most prominent carbon source at all sites (23-45%), while diesel exhaust contributed significantly only in urban environments (6-10%). The discrepancies between three source apportionment methods are variable, with good agreement in case of wood combustion particles and less conformity for aerosols resulting from fossil-fuel combustion.